

CLAIMS

What is claimed is:

1. A resist film removing apparatus used in a lithography process, of which a cleaning object is a flat substrate with a resist film formed on a surface thereof, comprising:

a transferrer to transfer the substrate;

an approximately linear-shape sprayer to spray cleaning liquid in a state of high-temperature liquid drops; and

a closer to form a closed space containing the substrate and said sprayer, and

wherein, when said sprayer causes the cleaning liquid in the form of liquid drops to contact with the resist film in a state in which the resist film of the substrate faces said sprayer in said closer, a temperature and humidity in said closer are regulated as predetermined, and a temperature of the cleaning liquid in the form of liquid drops contacting with the resist film is controlled.

2. The resist removing apparatus according to claim 1, wherein the substrate being the cleaning object is a glass substrate of a flat panel display.

3. The resist film removing apparatus according to claim 1, wherein said sprayer includes a first nozzle to supply water or liquid chemical and a second nozzle to supply water vapor or high-temperature gas, and

the water vapor or high-temperature gas supplied from the second nozzle causes the water or liquid chemical supplied from the first nozzle to be cleaning liquid in the form of liquid drops and contact with the resist film.

4. The resist removing apparatus according to claim 1, wherein said sprayer includes a first nozzle to supply water or liquid chemical, and a second nozzle to supply a high-temperature gas having a humidity of 100% in which water vapor and high-temperature gas are blended, and

the high-temperature gas having the 100% humidity supplied from the second nozzle causes the water or liquid chemical supplied from the first nozzle to be cleaning liquid in the form of liquid drops and contact with the resist film.

5. The resist film removing apparatus according to claim 1, wherein said sprayer includes a nozzle to supply water and liquid chemical, and

the nozzle causes the water or liquid chemical to contact with the resist film as cleaning liquid in the form of liquid drops.

6. The resist film removing apparatus according to claim 1, wherein the temperature of the cleaning liquid in the form of liquid drops contacting with the resist film is controlled at a value of 70°C or higher.

7. The resist film removing apparatus according to claim 1, wherein the liquid chemical contains a

resist alteration accelerating component.

8. An organic matter removing apparatus used in a lithography process of a printed board, of which a cleaning object is a flat printed board with an organic matter adhered to a surface thereof, comprising:

a transferrer to transfer the printed board;

an approximately linear-shape sprayer to spray cleaning liquid in a state of high-temperature liquid drops; and

a closer to form a closed space containing the printed board and said sprayer; and

wherein, when said sprayer causes the cleaning liquid in the form of liquid drops to contact with the organic matter, in a state in which the organic matter on the substrate faces said sprayer in said closer, a temperature and humidity in said closer are regulated as predetermined, and a temperature of the cleaning liquid in the form of liquid drops contacting with the organic matter is controlled.

9. A resist removing apparatus used in a lithography process, comprising:

a holder to hold a substrate to be cleaned on a surface of which a resist film is formed;

a sprayer to spray cleaning liquid in a form of high-temperature liquid drops; and

a closer to form a closed space containing the substrate and said sprayer in a state in which said sprayer faces the resist film; and

wherein, when said sprayer causes the cleaning liquid in the form of liquid drops to contact with the resist film, a temperature and humidity in said closer are regulated as predetermined, and a temperature of the cleaning liquid in the form of liquid drops contacting with the resist film is controlled.

10. The resist film removing apparatus according to claim 9, wherein the substrate to be cleaned is a semiconductor substrate.

11. The resist film removing apparatus according to claim 9, wherein the substrate to be cleaned is approximately circle-shaped.

12. The resist film removing apparatus according to claim 11, wherein the substrate is cleaned while being rotated.

13. The resist film removing apparatus according to claim 9, wherein the substrate to be cleaned is a photomask used in a photolithography.

14. The resist film removing apparatus according to claim 1, wherein said sprayer includes a first nozzle to supply water or liquid chemical, and a second nozzle to supply water vapor or high-temperature gas, and

the water vapor or high-temperature gas supplied from the second nozzle causes the water or liquid chemical supplied from the first nozzle to be cleaning liquid in the form of liquid drops and contact with the resist film.

15. The resist removing apparatus according to claim 9, wherein said sprayer includes a first nozzle to supply water or liquid chemical, and a second nozzle to supply the high-temperature gas having the humidity of 100% in which water vapor and high-temperature gas are blended, and

the high-temperature gas having the humidity of 100% supplied from the second nozzle causes the water or liquid chemical supplied from the first nozzle to be cleaning liquid in the form of liquid drops and contact with the resist film.

16. The resist film removing apparatus according to claim 9, wherein said sprayer includes a nozzle to supply water or liquid chemical, and

the nozzle causes the water or liquid chemical to contact with the resist film as cleaning liquid in the form of liquid drops.

17. The resist film removing apparatus according to claim 9, wherein the temperature of the cleaning liquid in the form of liquid drops when the liquid drops contact with the resist film is controlled at 70°C or higher.

18. The resist film removing apparatus according to claim 9, wherein the liquid chemical contains a resist alteration accelerating component.

19. The resist film removing apparatus according to claim 14, wherein a temperature of the water or liquid chemical supplied from the first nozzle is 70°C or higher.

20. The resist film removing apparatus according to claim 19, further comprising a heater to heat the water or liquid chemical supplied from the first nozzle at a temperature of 70°C or higher.

21. A resist removing method performed in a lithography process in removing the resist film formed on a surface of a substrate, said resist removing method comprising the steps of: holding the substrate in a closed space; and causing cleaning liquid to contact with the resist film in a form of liquid drops by controlling a temperature thereof by a predetermined temperature regulation, in a state which a temperature and humidity in the closed space are regulated as predetermined.

22. The resist film removing method according to claim 21, wherein the substrate to be cleaned is a semiconductor substrate.

23. The resist film removing method according to claim 22, wherein the substrate to be cleaned is approximately circle-shaped.

24. The resist film removing method according to claim 23, wherein the substrate is cleaned while being rotated.

25. The resist removing method according to claim 22, wherein the substrate to be cleaned is a photomask used in photolithography.

26. The resist film removing method according to claim 21, wherein water vapor or high-temperature gas causes water or liquid chemical to be cleaning liquid

in a form of liquid drops and contact with the resist film.

27. The resist film removing method according to claim 26, wherein the water or liquid chemical is at a value of 70°C or higher.

28. The resist film removing method according to claim 21, wherein a temperature of the cleaning liquid in the form of liquid drops contacting with the resist film is controlled in a value range of 70°C or higher.

29. The resist removing method according to claim 21, wherein the liquid chemical contains a resist alteration acceleration component.

30. A resist film removing method performed in a lithography process in removing a resist film formed on a flat surface of a substrate, comprising the steps of: transferring the substrate into a closed space; and causing cleaning liquid to contact with the resist film in a form of liquid drops by controlling a temperature thereof by a predetermined temperature regulation, in a state in which a temperature and humidity in the closed space are regulated as predetermined.

31. The resist film removing method according to claim 30, wherein the substrate to be cleaned is a substrate of a flat panel display.

32. The resist film removing method according to claim 30, wherein a temperature of the cleaning liquid in the form of liquid drops contacting with

the resist film is controlled at a value of 70°C or higher.

33. An organic matter removing method performed in a lithography process of a printed board in removing an organic matter adhered to a flat surface of the printed board, comprising the steps of: transferring the printed board into a closed space; and causing cleaning liquid to contact with the printed board in a form of liquid drops by controlling a temperature thereof by a predetermined temperature regulation, in a state in which a temperature and humidity in the closed space are regulated as predetermined.